A224 A Decade of Research on the Genetic Identification of the Manufacturers of Improvised Explosive Devices

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After attending this presentation, attendees will become familiar with the large amount of research that has been conducted at Michigan State University during the past ten years on post-deflagration genetic identification of individuals who manufacture IEDs, including tests of the device itself, trigger components, and containers used to conceal the device.

This presentation will impact the forensic science community by presenting an overview of the large amount of DNA-based research that has been conducted in a laboratory on identifying those who make IEDs. Both nuclear and mitochondrial DNA testing from deflagrated pipe bombs will be covered, as will post-blast testing of items associated with IEDs, including trigger components and packaging. The presentation will summarize the most effective methodologies for isolating and analyzing DNA from this type of forensic evidence.

Improvised explosive devices have become an integral weapon for terrorists, both inside and outside the United States. IEDs are generally simple to manufacture and conceal, often being made from components easily obtained from hardware and sporting good stores, and hidden in bags or backpacks. During the blast, much of the potential forensic evidence is destroyed, including fingerprints, thus only class evidence is usually recovered, such as the type of explosive used and the hardware of the device. This evidence may have value if its origin can be traced to a specific location (e.g., a store where it was purchased), but, in general, it does not lead to the identification of the perpetrator.

For the past decade, forensic biologists at Michigan State University, in collaboration with the Michigan State Police Bomb Squad, have studied genetic methods for identifying manufacturers of IEDs, based on the premise that even if fingerprints are destroyed on a deflagrated device, enough residual cellular material may remain that an identification is possible. The first such study used standard forensic DNA techniques on pipe bomb fragments and resulted in a few alleles consistent with an assembler. MtDNA was next tested, and produced a much higher rate of identification, based on a closed population of individuals. New assays of deflagrated IEDs, including both NIST-produced and commercial miniSTRs, showed greater sensitivity than did standard STRs. The methods for retrieving DNA from deflagrated IEDs, which can be fragmented into thousands of small pieces, were assessed by comparing swabbing and soaking both deflagrated PVC and steel bombs. Similarly, positive and negative influences of cyanoacrylate fuming IED fragments were examined.

Materials associated with IEDs have also been extensively tested, based on the idea that these may be handled longer than the device itself, and are more detached from the device, so they might maintain cells/DNA better. Mock electronic triggers made up of a communication device (cell phone or walkie-talkie), battery, circuit board, and wiring, were placed adjacent to IEDs during deflagration, and the components was assayed using miniSTRs. Genetic data from each individual component were analyzed, as were data from all components *in toto*.

Likewise, IED containers were tested post-deflagration. Backpacks were used for several days, then bombs were placed inside and deflagrated. Multiple regions recovered from a backpack (e.g., zippers, straps, canvas) were tested via miniSTRs, and individual and combined results were used to identify a wearer.

The ability to analyze STR data solely or in combination with other data from the same object (e.g., components of a triggering device or parts of a backpack) helped differentiate “consensus profiles” from those that might contain rare drop-in alleles or mixtures. In most instances, consensus profiling resulted in far more accurate data for the IED/component handler than did STR results from individual objects.

Altogether, it is clear that genetic evidence can be obtained from deflagrated IEDs and the components associated with those weapons. However, such testing, while very sensitive, is dominated by low copy number and highly degraded DNA. As such, it can potentially be lost or compromised during evidence collection and processing, is susceptible to external contamination, and is affected by methods of DNA isolation, testing, and data analysis.

DNA, IED, Touch DNA

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